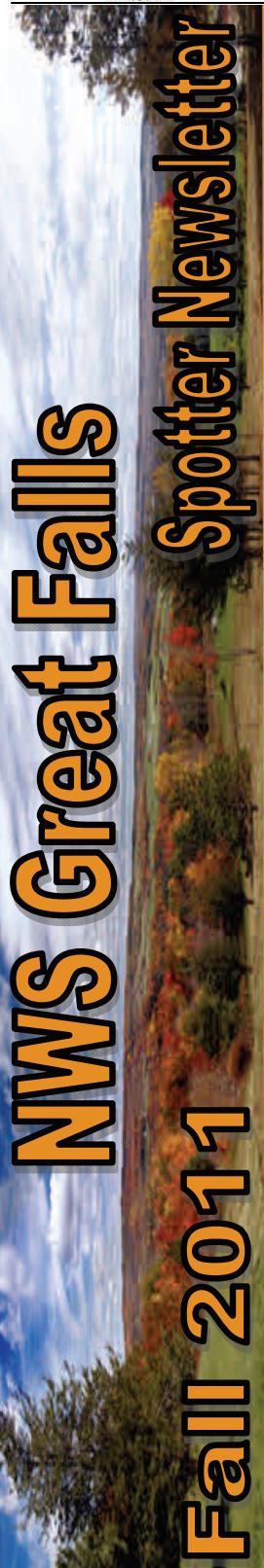




Issue Headlines:

- Dual Polarization Radar Upgrades
- 90 Day Temp & Precip Outlook
- Dangers of Convective Storms

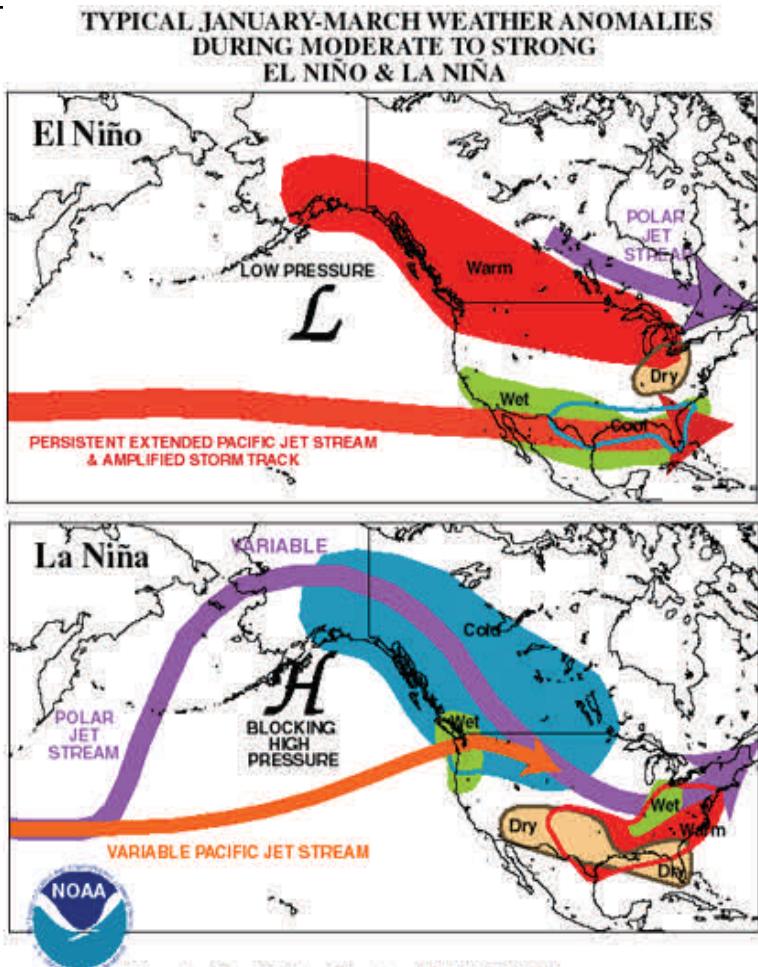


Why the late Spring and cooler Summer?

In the last 4 years the region has experienced the effects of both El Niño (a warming of the waters near the equator in the Pacific Ocean) and La Niña (a cooling of the waters near the equator in the Pacific Ocean). Both have an effect on weather patterns across the entire globe.

In our area El Niño winters tend to produce conditions with above normal temperatures and below normal precipitation, while La Niña winters lean towards below normal temperatures and above normal precipitation. Typically, each of these events starts to influence weather patterns by mid to late December, and weakens their effects by March or early April. But there is something else going on, something else that has been influencing the weather patterns, modifying them well into May and even July...some would even argue more so than El Niño or La Niña.

Continued on page 6



Climate Prediction Center/NCEP/NWS

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Coming soon to a radar near you...Dual Pol!

By John Blank

During the next few years the existing network of radars across the U.S. will be upgraded to dual polarization. So now you are asking...What is a dual polarized radar?

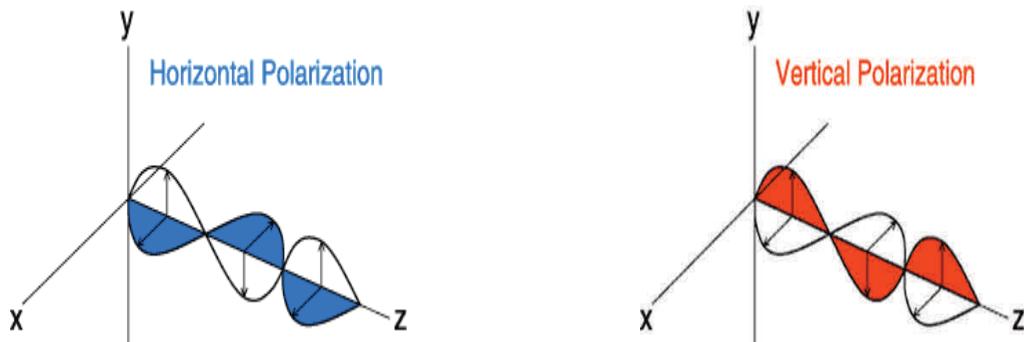
First let's back up to explain how weather radars work.

Weather radars transmit short pulses of radio waves at a rate of approximately 1000 pulses per second, with each pulse lasting only about a millionth of a second. After each pulse, there is a short time period during which the radar is not transmitting. Rather, during this time the radar is listening for a "reflected signal" from the cloud. This reflected signal is the result of the energy from the transmitted pulse interacting with cloud (cloud water and cloud ice), precipitation (snow, ice pellets, hail, and rain) or other particles such as dust, birds, insects, etc. A small portion of the power is then returned to the antenna, and analyzed by the radar signal processor to determine an estimate of the rain or snow rate.

Doppler radars (our current network of radars) have the added capability of being able to measure a *frequency shift* that is introduced into the reflected signal by the motion of the cloud, precipitation or other particles. This shift is then used to determine wind speed.

So how do Dual Polarization radars differ from Doppler radars?

Most weather radars, such as the current National Weather Service NEXRAD radar, transmit radio wave pulses that have a horizontal orientation. Polarimetric radars transmit radio wave pulses that have both horizontal and vertical orientations. Hence the name dual polarization or dual pol.



The horizontal pulses essentially give a measure of the horizontal dimension of cloud (cloud water and cloud ice) and precipitation (snow, ice pellets, hail, and rain) particles while the vertical pulses give a measure of the vertical dimension. Since the power returned to the radar is a complicated function of each particles size, shape, and ice density, this additional information will result in better weather predictions discrimination and predictions.

Dual Pol Radar, continued

How can dual pol radar measurements lead to better weather predictions?

Radars won't tell you if it is going to rain tomorrow. However, once a cloud does develop and precipitation starts falling, they can be used to examine storm structure and estimate rain and snow rates.

The improvements associated with dual pol radars comes from their ability to provide previously unavailable information on cloud and precipitation particle type size, shape, and ice density. With this in mind, just a few of the potential applications of dual pol radar data are listed below.

- Improved estimation of rain and snow rates.
- Discrimination of hail from rain and possibly hail size.
- Identification of precipitation type in winter storms.
- Identification of electrically active storms.
- Identification of aircraft icing conditions.

What else can dual pol radar detect?

In addition to providing information on cloud and precipitation particle type size, shape, and ice density, dual pol radar variables also exhibit unique signatures for many non-meteorological scatterers. Examples of these would be birds and insects. Though radar measurements of birds and insects may not at first appear to be of interest to meteorologists, there are indeed applications. For example, birds are hazardous to aircraft. Therefore, radar measurements of birds might interest the aviation industry.

Radar measurements of bugs might interest entomologists who study, for example, crop damage resulting from bug migrations.



Adapted from <http://www.cimms.ou.edu/~schuur/radar.html>

Seasonal Temp & Precip Outlook

By Erik Gustafson

Each month, the Climate Prediction Center (CPC) issues seasonal outlooks of the probability of deviations from normal temperature and precipitation, for the lower 48 states, for a total of 13 seasons, each of which covers a period of 3 calendar months.

The seasonal temperature outlook for the period November through January is shown in Figure 1. A quick glance at this figure shows that the South Central United States is covered by orange which indicates better chances for “Above Normal” temperatures. Southern Alaska along with Northern Montana and North Dakota are colored blue which indicates better chances for “Below Normal” temperatures. Much of the rest of the lower 48 is uncolored with an “EC” label for equal chance of above or below normal temperatures.

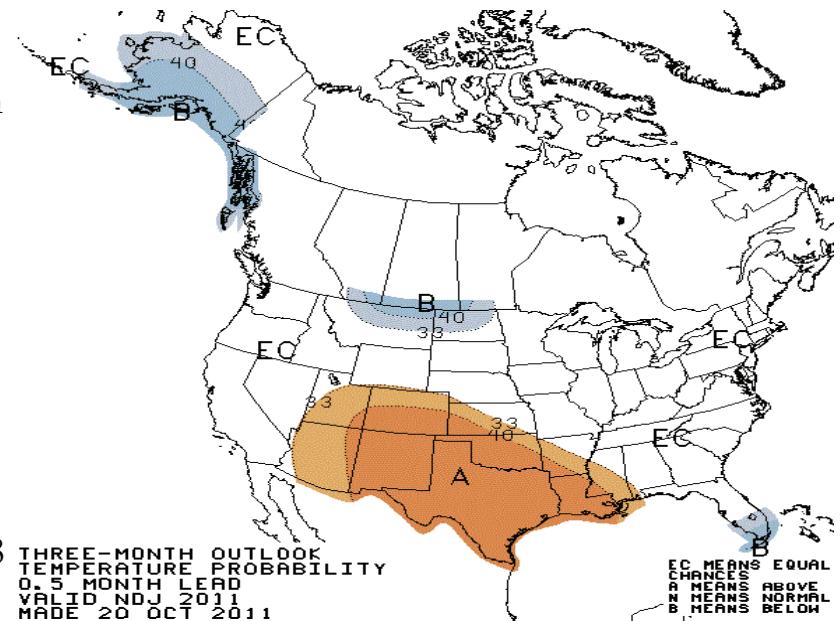


Figure 1. Temperature Outlook for November 2011 - January 2012.
A = Better chance for above average temperatures
B = Better chance for below average temperatures

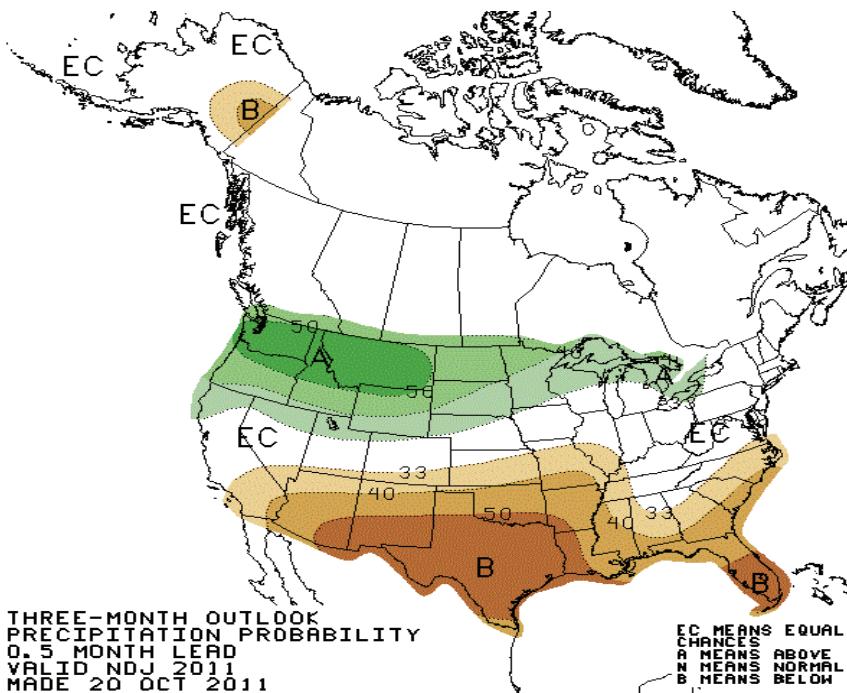


Figure 2. Precipitation Outlook for November 2011 - January 2012.
A = Better chance for above average precipitation
B = Better chance for below average precipitation

The seasonal precipitation outlook for the period November through January is shown in Figure 2. A quick glance at this figure shows that the Southern United States is covered by orange which indicates better chances for “Below Normal” precipitation. The Pacific Northwest extending to the Great Lakes is colored green which indicates better chances for “Above Normal” precipitation is likely. The Central and Northeast US are uncolored with an equal chance of above or below normal precipitation amounts.

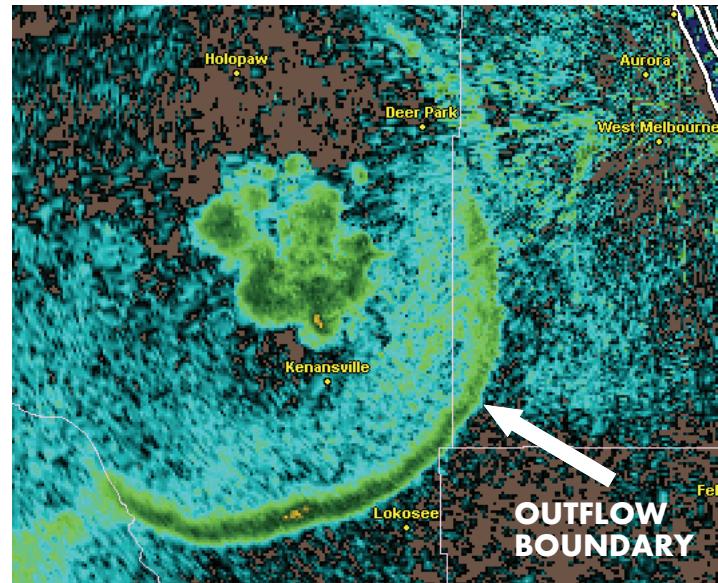
The Dangers of Convective Storms

By Erik Gustafson

The dangers of convective activity are well documented across the entire world. Here in Montana we often see summertime thunderstorms that develop strong and gusty winds, dangerous lightning, and damaging hail. One need not be a trained observer to be able to identify bad weather when it is approaching. However, some of the dangers posed by these storms are unexpected in a sense. Our brains and thought processes are wired to think that the danger from this bad weather will occur when the storm nears us. While it is true that the most dangerous effects of bad weather are usually seen closer to a storm's center, things like deadly cloud to ground lightning and extreme winds often occur far away from the storm itself.

One unfortunate example of this is the extreme winds that occurred at the Indiana State Fair in August 2011. For those unfamiliar with the event, strong thunderstorms in the area made their way towards the fairgrounds but it was strong outflow winds ahead of a storm that caused catastrophic damage and loss of life at a concert. Wind gusts upwards of 70 mph that preceded the storm caused scaffolding to buckle and collapse, resulting in numerous fatalities. This sad case should serve as a reminder that severe weather alerts and warnings are issued for the area around and ahead of storms to provide information to those in its path. The National Weather Service tries to issue warnings with as much lead time as possible in order to provide the maximum amount of time to find shelter and safety.

The accompanying image is an example from the Melbourne, FL radar of an outflow boundary 15 miles ahead of the actual storm. Remember, **if a storm is closing in on your location, the danger of severe weather already exists!** Find a safe location to wait out the storm until it has safely passed your area and all warnings have been cancelled.



Now is the time to schedule your winter and spring Spotter Training sessions!!

Please Contact **Ben Schott** by phone at:

(406) 453-2081

Or by email at:

Ben.Schott@noaa.gov

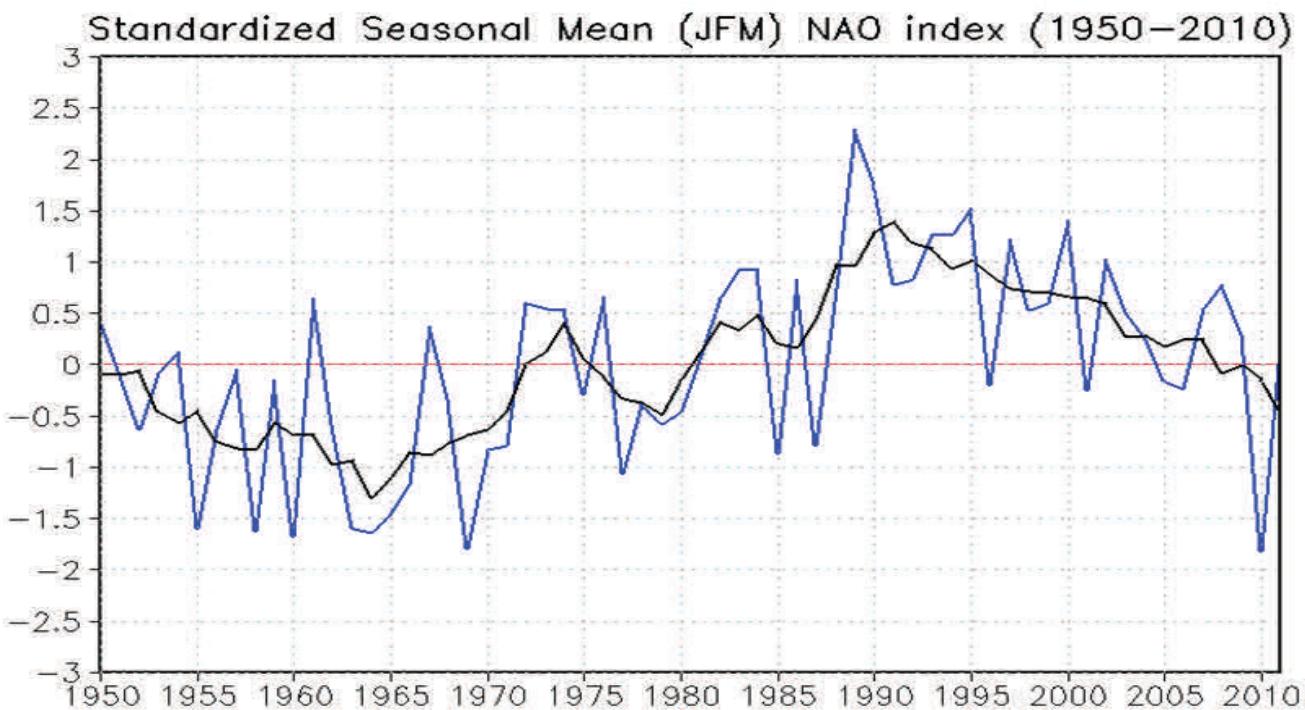


Why the late Spring and cooler Summer?

By Ben Schott

What is this other cycle that has been a dominant player in Montana's weather...it's the North Atlantic Oscillation or NAO. Yes, that's a mouthful! But it has shown a distinct shift in its phase over the last decade and we are now seeing some of the full effects across the Treasure State. The NAO is the difference in pressure across a huge area spanning across the Atlantic and its pattern runs on a 20 or 30 year cycle, unlike La Niña or El Niño which typically runs on a 2 to 5 year cycle.

Positive phases of the NAO tend to be associated with above-average temperatures in the eastern United States and extends westward into Montana during the late winter and spring. Opposite patterns of temperature anomalies are typically observed during negative phases of the NAO. Below is a look at the winter average indices of the NAO for each winter back to 1950 from the Climate Prediction Center (<http://www.cpc.ncep.noaa.gov/>).

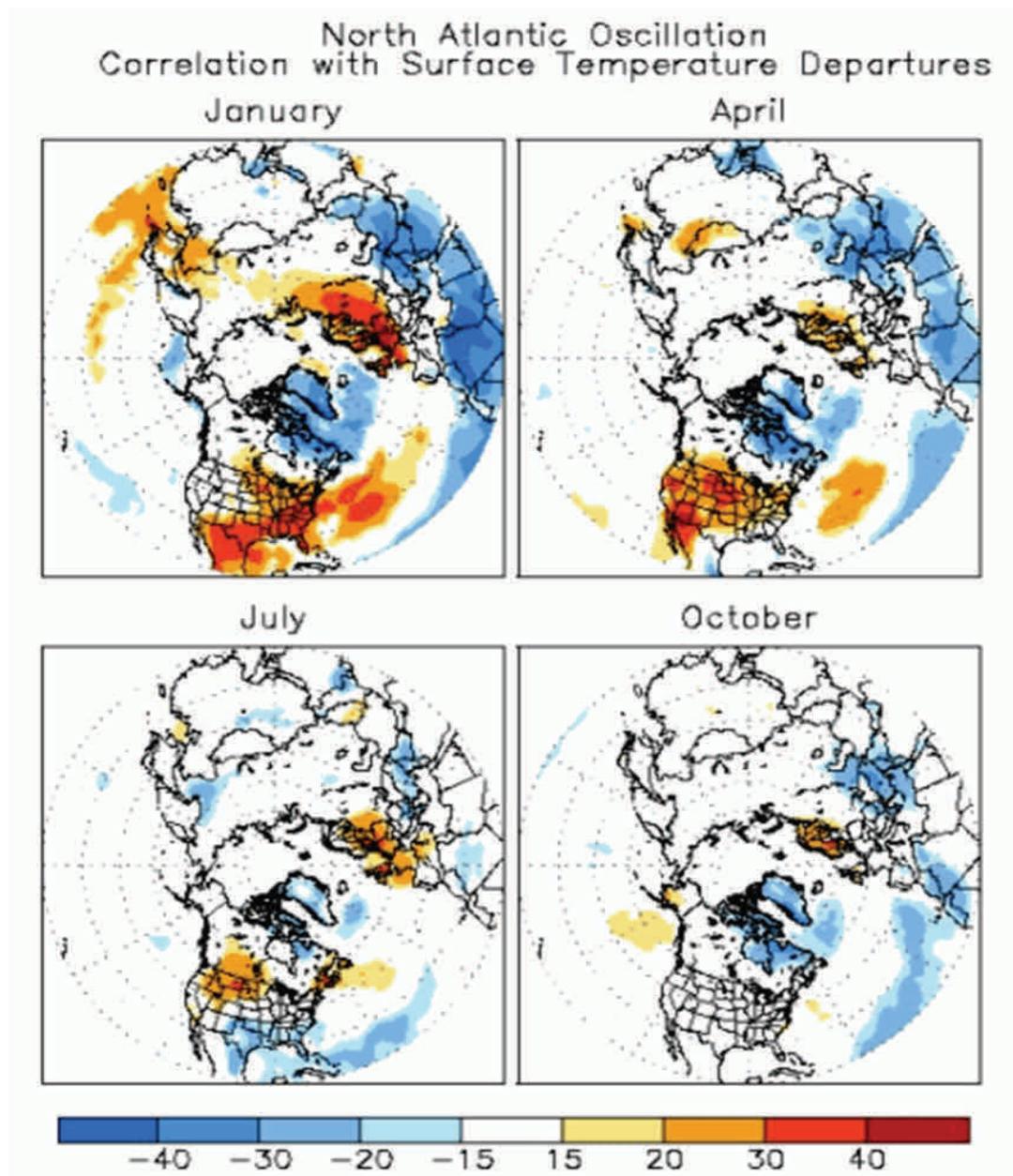


Do you see anything interesting? It may not be perfectly clear, but the NAO has trended downward and negative over the last decade, and has been fully negative the last three years. Each of those years' spring and summer has come late and winter roared at times into May across Montana! This was not as common from the late 80s through the first few years after

Why the late Spring and Summer cont.

2000. Also, notice where the NAO index was during some of those harsh winters of the 60s and 70s...will those conditions return, as well as the late springs and cooler summers? It is more likely to happen during the next decade or so as this cycle moves through this negative phase.

The maps below shows how the NAO influences temperatures in a positive phase, showing warmer than normal temperatures across Montana in April and July. During the negative phase (the current phase), the opposite is more likely to occur with below normal temperatures extending through spring into summer.



A Moon by Any Other Name

By Don Emanuel

The moon has long been a source of wonder and fascination for humankind. It has served as inspiration for poets and romantics, feared when it became eclipsed, and has been the subject of countless stories, paintings, and songs. Even after being visited by twelve Americans in the late 1960s and early 1970s, the moon continues to be a mysterious but familiar and constant companion in the night sky.

Did you know the full moon is known by many names, according to various cultures? The best known full moons are the Harvest Moon of September and the Hunter's Moon of October. The Harvest Moon is the full moon that occurs closest to the autumnal equinox. About once every four years this will occur in October with October 7 being the latest a harvest moon can occur. The light from these autumn full moons helps farmers bringing in their crops and allows hunters additional time to track their prey. The Harvest Moon often appears larger than other full moon as it rises in the east. This is really only an illusion as the human brain perceives a low-hanging moon to be larger than a moon that is higher in the sky.

Some other names given to the full moon:

January - Wolf Moon, Old Moon

February – Ice Moon

March – Sap Moon, Worm Moon, Crow Moon

April – Pink Moon, Grass Moon, Rain Moon

May – Flower Moon, Planting Moon, Milk Moon

June – Strawberry Moon, Rose Moon

July – Thunder Moon, Buck Moon, Hay Moon

August – Sturgeon Moon, Corn Moon

November – Beaver Moon, Frost Moon, Snow Moon

December – Cold Moon, Long Night Moon



Greek mythology referred to the moon as Selene and the Romans called the moon Luna. Whatever name you choose, take some time to greet the moon as it travels across the Big Sky!

Winter Weather Safety

By Megan Syner

Winter is rapidly approaching and if you are like me you may be waxing your skis or tuning up your snowmobile. Cold temperatures and snow make being outdoors during the winter significantly more dangerous. Extra safety precautions should be taken given the more extreme and changing conditions. The most important thing to remember when heading outdoors in the winter is to dress in layers to stay warm and dry. Be sure to wear a scarf or knit mask to cover your face and mouth; gloves or mittens, and water-resistant coats, pants, and boots. Do not leave skin exposed to the cold and avoid exertion. Be prepared to take emergency shelter if the weather changes, especially if you are planning on being outside all day, and always pack extra dry clothing, two-way radios, and waterproof matches. If you are caught outside in a snowstorm or blizzard, know how to build a lean-to, windbreak or snow cave for protection from winds. Always be aware of how you are feeling and watch for signs of cold-weather health problems such as frostbite and hypothermia. Always provide family or friends information on where you are headed.

A winter hazard in the mountains is avalanches. First of all, if you are traveling in avalanche-prone areas always have a partner and know the terrain you will be traveling in. Also, carry and know how to use an avalanche beacon or transceiver, shovel, probe and slope meter. Avalanches most commonly occur at slope angles between 35 and 40 degrees; however they can occur at any angle. Look at similar surrounding slopes for signs of recent avalanche activity and look for areas of safe travel. Last but not least, always assess the snowpack before traversing and descending a slope.

Aside from outdoor winter weather safety, there are many ways you can prepare your home, office and vehicle for the winter. Here are some winter weather safety tips that you

At Home/Work:

- Flashlight & extra batteries.
- NOAA Weather Radio and portable radio to receive emergency information.
- Extra food, water & baby items.
- First-aid supplies.
- Heating fuel.
- Emergency heat source.
- Fire extinguisher, smoke alarm.
- Make sure pets have food, water and shelter.

In Vehicles:

- Check and winterize your vehicle before winter begins.
- Carry a Winter Storm Survival Kit.
- Keep your gas tank full to avoid ice in the tank and fuel lines.
- Avoid traveling alone.
- Let someone know your plans.
- First-aid supplies.

On the Farm:

- Move animals to shelters.
- Haul extra feed outside.
- Have water available.
- Make sure pets have plenty of food, water and shelter.
- First-aid supplies.



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5324 Tri-Hill Frontage Rd
Great Falls, MT 59404
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⇒ **Hazardous Weather Outlook**

Highlights of dangerous or potentially severe weather for next seven days

⇒ **Severe Thunderstorm Watch/Warning**

Thunderstorms with wind gusts of 58 mph or higher, 1 " or larger diameter hail

⇒ **Tornado Watch/Warning**

Warnings for active tornadoes or conditions that show strong likelihood of a tornado developing

⇒ **Flood and Flash Flood Watch/Warning**

Flooding from snow melt, heavy rain, ice jams, etc.

⇒ **Winter Weather Advisories**

Winter weather impacts for snow, blowing snow, and freezing rain which do not meet warning level criteria

⇒ **Winter Storm Watch/Warning**

Moderate to major impacts for snow, blowing snow, and freezing rain. Snow accumulations of 6 inches or more in 12 hrs, or 8 inches or more in 24 hrs, for elevations below 6000 ft. Snow accumulations of 8 inches or more in 12 hrs, or 12 inches or more in 24 hrs, for elevations above 6000 ft.

⇒ **Blizzard Watch/Warning**

Snow and wind combining to reduce visibilities to under 1/4 mile for more than 3 hours

⇒ **High Wind Watch/Warning**

Winds of at least 58 mph not a product of thunderstorms